eclipse, is to ascertain, if possible, what is the real nature of the mysterious light which forms the corona, and which often streams from the solar photosphere in extended and fantastic forms. We venture to suggest that, for the promotion of that calmness of spirit which is essential to the successful investigation of scientific truth, the refutation of scientific error should in all cases be free from even the appearance of strife and personality. But, passing from the criticisms on Mr. Lockyer's theory of the solar corona, the fate of Mr. Lassell, the present accomplished and experienced president of the Astronomical Society, is not more fortunate. Mr. Lassell, after years of careful observation with a magnificent instrument, unique of its kind, comes to the conclusion that not more than *four* satellites of Uranus have ever been certainly observed. Mr. Proctor, however, thus writes : "I have very little doubt that Uranus has at least eight satellites." And again, although our author admits that Sir William Thomson seems to have abandoned his theory of the probable supply of the sun's heat and light by a battery of meteors, nevertheless he thus writes : "*I am quite certain** . . . . that at least an important proportion of the sun's heat is supplied from the meteoric streams which circulate in countless millions around him" p. 205). We may fairly ask whence has Mr. Proctor this *certain* knowledge of *countless millions of meteoric streams* impinging on the sun? And how can he, with reference to the satellites of Uranus, venture to set his *opinion* in antagonism with the results of the protracted observations of so accomplished and experienced an astronomer as Mr. Lassell?

We may call Mr. Proctor's attention to the probable inadvertency of his description of the hydrogen spectrum as *white*, which it is not in any sense ; and to his inexact description of Mr. Carrington's remarkable observation of what may have been a solar outburst. Mr. Carrington did not use, and he could not have used, as Mr. Proctor assumes, a dark glass in projecting the solar image on a screen, and consequently the alleged *breaking of this dark glass* by the presumed solar outburst, could have occurred in our author's imagination alone. These mis-statements, however, are easily corrigible in a second edition, presuming they are not typical of much else in the volume itself.

We think so highly of Mr. Proctor's astronomical knowledge and general ability, that we have ventured to point out what strike us as blemishes in a work which contains so much that is suggestive and valuable. Among the portions that are most suggestive are Mr. Proctor's remarks on the distribution and motions of the stars *in streams ;* we are far from satisfied that our author has as yet made good his case ; but whether his theory be correct or not, the suggestions are valuable, and afford ample scope for the astronomy of the future. Overlooking, however, and forgetting the blemishes, we feel no hesitation in recommending this volume to the perusal of all who are interested in the progress of one of the noblest and most fascinating of the sciences. Some of the plates which illustrate the volume are a decided advance upon all their predecessors of a like kind, and augur well as promises of yet further improvements.

C. PRITCHARD

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* The italics are ours.

OUR BOOK SHELF

Balfour's Class-book of Botany; being an Introduction to the Study of the Vegetable Kingdom. With upwards of 1,800 illustrations. Third edition. (Edinburgh : A. and C. Black, 1870.)

PROFESSOR BALFOUR'S "Class Book of Botany" is too well and favourably known to botanists, whether teachers or learners, to require any introduction to our readers. It is, as far as we know, the only work which a lecturer can take in his hand as a safe text-book for the whole of such a course as is required to prepare students for our university or medical examinations. Every branch of botany, structural and morphological, physiological, systematic, geographical, and palæontological, is treated in so exhaustive a manner as to leave little to be desired. The illustrations also form, when enlarged, the very best set of diagrams that a lecturer can have. After this, it may seem hypercritical to find any fault with the new edition. We cannot, however, but regret that the opportunity was not taken of rendering the book still more complete by bringing it down to our present state of knowledge. As stated on the title-page, the additions and corrections are entirely confined to the department of organography, and, as far as they go, are valuable. In particular, the treatment of the subjects of carpology, inflorescence, and phyllotaxis, is rendered much more complete. In other departments we have no such additions, and we miss any reference to the recent labours of Hildebrand, Parlatore, and others, following those of Darwin in the department of fertilisation ; of King, Strasburger, and many others in the structure of the reproductive organs of Cryptogams, or to the remarkable observations of Prillieux, Rose, and Brongniart on the movements of chlorophyll. In the department of vegetable palæontology in particular, Unger, Schimper, Heer, Ettingshausen, Dawson, and Carruthers have rendered the science of 1854 scarcely recognisable in 1870 ; and yet we find not a word added, even to the first edition. The fault appears to be that the book was "stereotyped." Scientific works ought never to be stereotyped. The author has evidently been exceedingly cramped in the insertion of new matter, and the correction of errors has been rendered impossible. Thus we find repeated the old account of the mode of fertilisation in *Parnassia*, which has been shown by both English and Continental botanists to be erroneous, and illustrated by a drawing which is quite incorrect. The work is one, however, which is indispensable to the class-room, and should be in the hands of every teacher. A. W. B.

Proceedings of the London Mathematical Society. Vols. I. and II.

THIS Society met for the first time in January, 1865. At that time the only society in London which received mathematical papers was the Royal Society, while the Philosophical Society of Cambridge naturally took its tone from the university examinations, and paid more attention to the proposal and solution of problems than to the working out of new principles. The present society was formed mainly in order that investigations carried on independently over a wide range of subjects might be compared, and that from the comparison there might grow up some new calculus which should bear to the analysis of the present day the same kind of relation that integration bears to Wallis's elaborate investigations of the properties of the centre of gravity. There were other collateral objects of scarcely inferior importance, such as the improvement and extension of the language of mathematics, the simplification of demonstrations of known truths, and the study of the history of mathematics. There is scarcely a branch of pure mathematics in which the society has not advanced the boundaries between the known and the unknown, but the attention of the leading members has been chiefly devoted to the higher curves.

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The introduction of a new word or phrase has often marked an epoch in the history of a science; many of the theories systematised by Darwin are to be found in the writings of others before the happy phrase "natural selection" gave them a simple and enduring shape. Of like importance is Mr. Grove's expression, "correlation of forces," and we find in these proceedings several words, the introduction of which appears likely to play an important part in the development of the science.

The word "quantic" for a "rational and integral function" has been for many years in use, but "deficiency" for the number by which the double points of a curve (including cusps) fall short of the maximum $\frac{1}{2}(n-1)(n-2)$, and "unicursal curves" for those curves in which the deficiency = 0, or, in other words, curves in which the co-ordinates (x, y, z) can be expressed as rational and integral functions of a parameter θ, were first used by Prof. Cayley before this society.

The history of mathematics is enriched by an interesting paper by Mr. Merrifield, showing that the Arabs were acquainted with the property of the radical axis.

Prof. Sylvester's proof of Newton's celebrated rule for the discovery of imaginary roots, hitherto undemonstrated, and Prof. DeMorgan's simple proof that every function has a root (which we should be glad to see in a fuller form) are the principal gains in the mere demonstration of known truths. We could wish to see in print the other communications made to the society by Professors Sylvester and DeMorgan, especially those by the former relating to unicursal derivation of successive points on cubic curves, and to residuals.

We heartily congratulate the society on the vitality and enthusiasm evident in every page of its proceedings, and join with them in their hope that they may shortly obtain a tenement of their own worthy of the great, albeit unostentatious, work in which they are engaged.

H. A. N.

Jahrbuch der K.-K. Geologischen Reichsanstalt. Band XIX. Nos. 3 and 4. 1869.

OF this admirable repertory of memoirs on the geology of the Austrian Dominions, the last two numbers for 1869 have lately reached us. This publication contains the cream of the communications made by members of the Imperial Geological Institution, to which the carrying out of the survey of that great and varied tract of country subject to the Austrian sovereign is entrusted; it always includes many papers of great importance to the student of general geology, and the portions now before us present no falling off in this respect. Of strictly geological papers Prof. D. Stur is the principal contributor. He describes the occurrence of brown coal in the district of Budafa, in Hungary; reports at considerable length on the results of the geological survey of the environs of Schmöllnitz and Göllnitz, also in Hungary; and contributes two other papers of more strictly local interest; but the most important of all the geological memoirs is F. von Hauer's notice of the geology of the Western Carpathians, a most interesting district in every respect. Dr. M. Neumayr's contributions to the knowledge of indigenous fossil faunæ contain descriptions of the univalve shells of the freshwater marls of Dalmatia, and of the Congerian strata of Croatia and Western Sclavonia; the species, many of which are new, are well represented on four plates. Five plates are also devoted to the illustration of another palæontological paper, which will probably possess the most interest of all for extra-Austrian geologists—namely, Dr. E. von Mojsisovics's memoir on the Cephalopod-fauna of the Alpine Muschelkalk, some of the species included in which are remarkable for their wide geographical distribution, especially the characteristic species of the zone (*Arcestes* or *Ammonites Studeri*), which ranges to the Himalayas in one direction, and to Spitzbergen in another.

LETTERS TO THE EDITOR

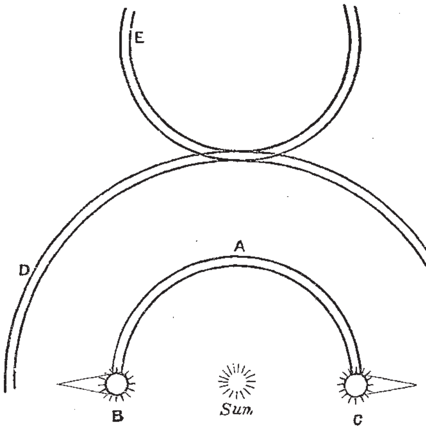
[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Parhelia

(1.) *Seen near Llandudno on 23rd of June, by* JOSEPH PAGET

THIS evening the phenomenon of which a sketch is enclosed was seen here, viz.:—

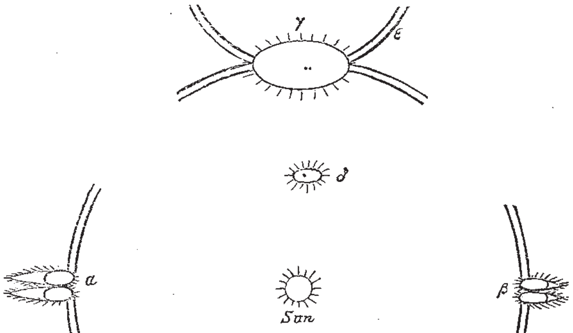
A B C, a portion of a circle of 45° diameter, resting at B and C on mock suns from which a sheaf of light proceeded outwards.



D, a portion of another circle of 90° diameter, at the apex of which was an inverted portion of another circle E of 45° diameter.

(2.) *Seen at Highfield House, near Nottingham, on 23rd of June*

At $7^h\ 36^m$ P.M., there was an extraordinary appearance in the heavens. Immediately above the true sun, at a distance of 23°, was an oval-shaped mock sun δ, colourless and not bright; at the distance of 90° from the true sun, and on its horizontal level were two double mock suns, α β, strongly prismatic and very brilliant. They were oval, and from each a flame-like ray extended in the opposite direction to the true sun, portions of a circle of 90° in diameter passed through these mock suns and also through an unusually large mock sun γ, situated 45° immediately above the true sun, and which was prismatic and almost too brilliant to look at; from this mock sun there was also a portion of a circle of 45° in diameter.



The phenomenon faded away at $7^h\ 53^m$ P.M. The weather had been hot from the 13th inst., reaching 86·8° in the shade on the 21st, and 86·6° on the 22nd; whilst on the 23rd (the day of this occurrence) it was only 72°, and on the morning of the 24th, the minimum temperature had fallen to 42·9° at four feet, and to 38·2° on the grass, or a fall of 43·8° in temperature in

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